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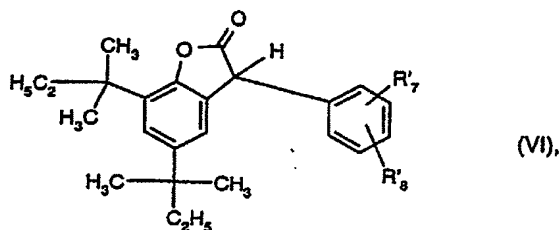
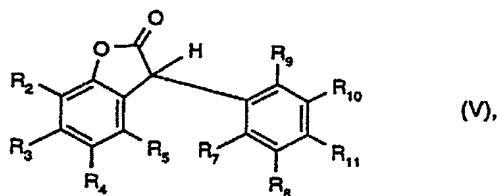
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(54) Abstract Title

3-Aryl-5-substituted-3H-benzofuran-2-one derivatives and their use as stabilizers of organic material against degradation by light, oxygen or heat

(57) Novel compounds of the formula V or VI



wherein

R₄ is -(CH₂)_s-COR'₁₅ or -CH(CH₃)-COR'₁₅ or -C_tH_{2t}-COR'₁₅, wherein C_tH_{2t} is a straight chain or branched alkylene moiety; or R₄ is -O-(C_vH_{2v})-COR'₁₅; -O-(CH₂)_q-OR'₃₂; -OCH₂-CH(OH)-CH₂-R'₁₅; or -OCH₂-CH(OH)-CH₂-OR'₃₂;
R'₇ is C₁-C₄alkyl and R'₈ is hydrogen or C₁-C₄alkyl; and the remaining residues are as defined in claim 1 (and further remaining residues are as defined in GB 2343007), can be used as additives, for example as dye stabilizer, as scavengers for oxidised developers, or as an antioxidant or stabilizer for organic materials against degradation by light, oxygen and/or heat.

This print takes account of replacement documents submitted after the date of filing to enable the application to comply with the formal requirements of the Patents Rules 1995

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Colour Photographic Material

The present invention relates to colour photographic material comprising a certain lactone (benzofuran-2-one) type compound, to the use of this compound as an additive to photographic material, especially as scavenger for the oxidised form of the developer (Dox-scavenger), to some new compounds of the benzofuran-2-one class, and their use as stabilisers for organic material against oxidative, thermal and/or light-induced degradation.

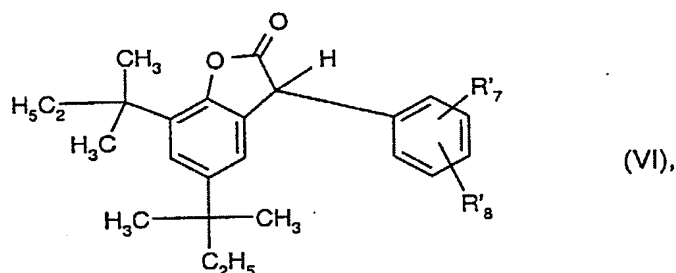
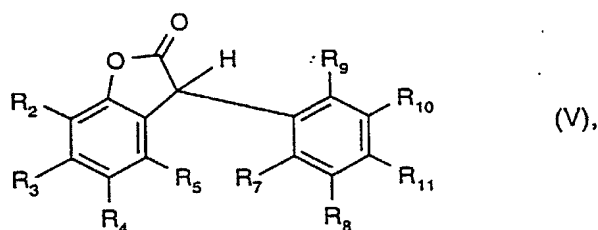
It is well known that one of the problems associated with colour photography is the diffusion of the oxidised colour developer away from the light sensitive silver halide emulsion layer in which it is formed into another silver halide emulsion layer, which can result in the formation of unwanted dyes at undesired places. For instance, while being generated in the green sensitive layer and forming a magenta dye through a coupling reaction with the incorporated magenta coupler, the oxidised developer can also diffuse to the red sensitive layer thereby producing unwanted cyan dye or to the blue sensitive layer thereby producing unwanted yellow dye. This kind of colour formation in the wrong layers will damage the colour balance of the photographic image and thus result in poor colour reproduction. One way of circumventing this problem is to incorporate oxidised developer scavengers in interlayers between the light sensitive silver halide emulsion layers. These scavengers should have additional properties such as low tendency to migrate, good stability towards aerial oxidation and high solubility in photographic oils.

Several classes of compounds that are useful as scavengers for oxidised developers are known in literature, e.g. specific derivatives of hydroquinone (EP-A-560198), or compounds of the classes sulphonamidophenol, gallic acid, resorcinol, catechol, aminophenol or aminonaphthol; or natural antioxidants such as vitamin E or vitamin C.

Some compounds of the class benzofuran-2-one are described in US-4611016 or US-5814692 and publications cited therein. Photographic material containing a certain type of benzofuran-2-one is mentioned in US-3615521 (use as precursor of photographic developing agent) and in US-4366240 (hydroxy substituted compounds as electron donor precursors for reducible colour providing compounds). EP-A-871066 mentions the use of a symmetrically substituted 3-(2-hydroxyphenyl)-benzofuran-2-one in the interlayer of a colour photographic material.

It has now been found that certain compounds of the 3-aryl-benzofuran-2-one class are especially useful as additives to photographic material. They are effective in a number of applications and find utility, for example, as scavengers for the oxidised developer (also termed hereafter Dox scavengers), as dye stabilisers, as antioxidants or as antifoggants. Liquid compounds of the below formula I can also be used as a photographic oil. These compounds are especially stable towards aerial oxidation, diffusion fast and also exhibit a good solubility in high boiling photographic oils. They are well suited for use in photographic elements containing pyrazolotriazole couplers as magenta dye providing compounds, since they are harmless to the light fastness of magenta images obtained from such pyrazolotriazole couplers.

This invention pertains to a compound of the formula V or VI



wherein

R_4 is $-(CH_2)_s-COR'_{15}$ or $-CH(CH_3)-COR_{15}$ or $-C_tH_{2t}-COR_{15}$, wherein C_tH_{2t} is a straight chain or branched alkylene moiety; or R_4 is $-O-(C_vH_{2v})-COR_{15}$; $-O-(CH_2)_q-OR_{32}$; $-OCH_2-CH(OH)-CH_2-R_{15}$; or $-OCH_2-CH(OH)-CH_2-OR_{32}$;

R'_7 is C_1-C_4 alkyl and R'_8 is hydrogen or C_1-C_4 alkyl;

R₁₅ is hydroxy; $\left[-O^- \frac{1}{r} M^{r+} \right]$; C₁-C₂₀alkoxy; C₃-C₂₀alkoxy interrupted by O and/or

substituted by a radical selected from OH, phenoxy, C₇-C₁₅alkylphenoxy, C₇-

C₁₅alkoxyphenoxy; or R₁₅ is C₅-C₁₂cycloalkoxy; C₇-C₁₇phenylalkoxy; phenoxy; $\begin{array}{c} R_{24} \\ \diagup \\ -N \\ \diagdown \\ R_{25} \end{array}$;

or a group of formula IIIa or IIIb;

R'₁₅ is C₃-C₂₀alkoxy interrupted by O and/or substituted by a radical selected from OH, phenoxy, C₇-C₁₅alkylphenoxy, C₇-C₁₅alkoxyphenoxy; or R₁₅ is C₅-C₁₂cycloalkoxy; C₇-C₁₇phenylalkoxy; phenoxy; or a group of formula IIIa or IIIb;

R₃₂ is C₁-C₁₈alkanoyl; C₁-C₈alkanoyl substituted by phenyl or C₇-C₁₅alkylphenyl; C₃-C₁₈alkenoyl; cyclohexylcarbonyl; or naphthylcarbonyl;

L is a linking group of valency (k+1) and

L is as a divalent group -O-; Q-C₂-C₁₂alkylene-Q; -O-CH₂-CH(OH)-CH₂-O-; -Q-C₂-C₁₂alkylene-Q-CO-C_vH_{2v}-O-; -O-C₂-C₁₂alkylene-O-CH₂-CH(OH)-CH₂-O-; Q-interrupted Q-C₄-C₁₂alkylene-Q; Q-phenylene-Q or Q-phenylene-D-phenylene-Q with D being C₁-C₄alkylene, O, S, SO or SO₂;

L as a trivalent group is Q-capped C₃-C₁₂alkanetriyl, a trivalent residue of a hexose or a hexitol, or a group (-O-CH₂)₃C-CH₂OH; -Q-C_aH_{2a}-N(C_bH_{2b}-Q)-C_cH_{2c}-Q-;

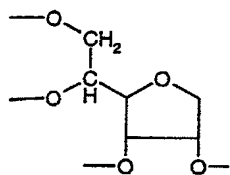
-Q-C₃-C₁₂alkanetriyl(-Q-CO-C_vH_{2v}-O-)₂;

-O-C₃-C₁₂alkanetriyl(-O-CH₂-CH(OH)-CH₂-O-)₂; and

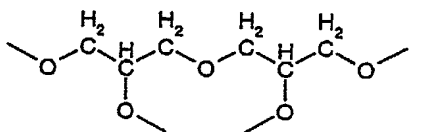
L as a tetravalent group is a tetravalent residue of a hexose or a hexitol;

-Q-C₄-C₁₂alkanetetriyl(-Q-CO-C_vH_{2v}-O-)₃;

-O-C₄-C₁₂alkanetetriyl(-O-CH₂-CH(OH)-CH₂-O-)₃; Q-capped C₄-C₁₂alkanetetriyl; a group



or a group



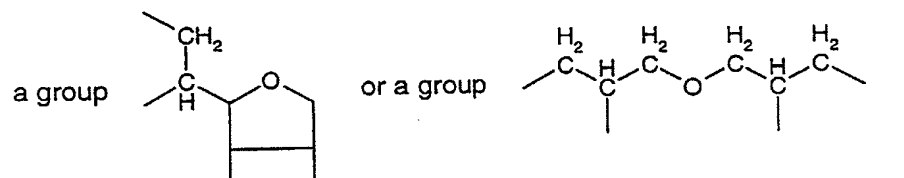
v is 1, 2, 3, 4, 5, 6, 7 or 8, preferably 1 or 2;

Q is oxygen or -NH-,

Z is a linking group of valency (k+1) and is as a divalent group C₂-C₁₂alkylene, Q-interrupted C₄-C₁₂alkylene, phenylene or phenylene-D-phenylene with D being C₁-C₄alkylene, O, S, SO or SO₂;

Z as a trivalent group is C_3 - C_{12} alkanetriyl, a trivalent residue of a hexose or a hexitol, a group $(-CH_2)_3C-CH_2OH$, or a group $-C_aH_{2a}-N(C_bH_{2b})-C_cH_{2c}$; and

Z as a tetravalent group is a tetravalent residue of a hexose or a hexitol, C_4 - C_{12} alkanetetryl,



a, b, c and k independently are 1, 2 or 3,

m is 0 or a number from the range 1-12, preferably 1-6,

s is 1 or 2,

and t is a number from the range 3-12, preferably 3-6;

and all other residues are as defined for formula I if n is 1.

Preferred are compounds of formula V, wherein R_3 and R_5 are H and R_2 is C_1 - C_8 alkyl, especially tert.butyl or tert.pentyl. Where R_{15} or R'_{15} contains a group of formula IIIa or IIIb (di-, tri- or tetrameric benzofuranones of formula V), those compounds having symmetrical linking moieties are preferred.

Preferred compounds of the formula VI are those wherein R'_7 is methyl or isopropyl and R'_8 is hydrogen or methyl.

Compounds of the formulae V and VI are useful as stabilisers for organic material against degradation by light, oxygen and/or heat. Application of these compounds and methods of stabilising are generally as described in GB-A-2322861; examples for organic material which can be stabilized are listed, for example, in GB-A-2319523 from page 15, line 11, until page 20, line 25; possible costabilizers are as listed, for example, in GB-A-2319523 from page 21, line 16, until page 32, bottom line. Examples for organic materials which can be stabilized as well as methods of stabilization are also listed in US-5668200, from column 8, line 18, to column 11, line 25, and from column 18, line 29, to column 22, line 53, and additionally in column 25, lines 29-67; possible costabilizers and their dosage are as listed in US-5668200, column 11, line 51, to column 18, line 28, and column 22, line 54, to column 25, line 28, and in column 26, lines 9-15; these passages of US-5668200 are hereby incorporated by reference. Compounds of the formula V or VI are used for this application

preferably in an amount of 0.0005 to 5%, especially 0.01 to 1%, based on the weight of the organic material to be stabilised. The invention also pertains to a composition comprising (a) an organic material which may be subject to degradation by light, oxygen and/or heat, and (b) as stabilizer against these harmful effects a compound of the formula V and/or VI. Most preferred organic materials to be stabilized are synthetic organic polymers and organic dyes, especially thermoplastic polymers such as polyolefin, photographic materials or coating materials.

Halogen is typically chloro, bromo or iodo. Chloro is preferred.

Alkanoyl of up to 25 carbon atoms is a branched or unbranched radical, typically formyl, acetyl, propionyl, butanoyl, pentanoyl, hexanoyl, heptanoyl, octanoyl, nonanoyl, decanoyl, undecanoyl, dodecanoyl, tridecanoyl, tetradecanoyl, pentadecanoyl, hexadecanoyl, heptadecanoyl, octadecanoyl, eicosanoyl or docosanoyl. Alkanoyl of 2 to 18, in particular of 2 to 12, e.g. of 2 to 6, carbon atoms is preferred. Acetyl is particularly preferred. C_2-C_{25} Alkanoyl which is substituted by a di(C_1-C_6 alkyl)phosphonate group is typically $(CH_3CH_2O)_2POCH_2CO-$, $(CH_3O)_2POCH_2CO-$, $(CH_3CH_2CH_2CH_2O)_2POCH_2CO-$, $(CH_3CH_2O)_2POCH_2CH_2CO-$, $(CH_3O)_2POCH_2CH_2CO-$, $(CH_3CH_2CH_2CH_2O)_2POCH_2CH_2CO-$, $(CH_3CH_2O)_2PO(CH_2)_4CO-$, $(CH_3CH_2O)_2PO(CH_2)_8CO-$ or $(CH_3CH_2O)_2PO(CH_2)_{17}CO-$. C_3-C_{25} Alkanoyl which is interrupted

by oxygen, sulfur or $\begin{matrix} & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \end{matrix} N-R_{14}$ is typically CH_3-O-CH_2CO- , CH_3-S-CH_2CO- ,

$CH_3-NH-CH_2CO-$, $CH_3-N(CH_3)-CH_2CO-$, $CH_3-O-CH_2CH_2-O-CH_2CO-$, $CH_3-(O-CH_2CH_2)_2O-CH_2CO-$, $CH_3-(O-CH_2CH_2)_3O-CH_2CO-$ or $CH_3-(O-CH_2CH_2)_4O-CH_2CO-$.

Alkanoyloxy is oxygen-capped alkanoyl; preferences are mainly as can be derived from alkanoyl above.

Alkenoyl of 3 to 25 carbon atoms is a branched or unbranched radical, typically propenoyl, 2-butenoyl, 3-butenoyl, isobutenoyl, n-2,4-pentadienoyl, 3-methyl-2-butenoyl, n-2-octenoyl, n-2-dodecenoyl, isododecenoyl, oleoyl, n-2-octadecenoyl or n-4-octadecenoyl. Alkenoyl of 3 to 18, preferably of 3 to 12, e.g. of 3 to 6, most preferably of 3 to 4, carbon atoms is preferred.

C₃-C₂₅Alkenoyl which is interrupted by oxygen, sulfur or >N-R_{14} is typically

CH₃OCH₂CH₂CH=CHCO- or CH₃OCH₂CH₂OCH=CHCO-.

Alkenoyloxy is oxygen-capped alkenoyl; preferences are mainly as can be derived from alkenoyl above.

C₆-C₉Cycloalkylcarbonyl is typically cyclohexylcarbonyl, cycloheptylcarbonyl or cyclooctylcarbonyl. Cyclohexylcarbonyl is preferred. C₆-C₉Cycloalkylcarbonyloxy is oxygen-capped cycloalkylcarbonyl; preferences are analogous.

C₁-C₁₂Alkyl-substituted benzoyl which preferably carries 1 to 3, more preferably 1 or 2, alkyl groups is typically o-, m- or p-methylbenzoyl, 2,3-dimethylbenzoyl, 2,4-dimethylbenzoyl, 2,5-dimethylbenzoyl, 2,6-dimethylbenzoyl, 3,4-dimethylbenzoyl, 3,5-dimethylbenzoyl, 2-methyl-6-ethylbenzoyl, 4-tert-butylbenzoyl, 2-ethylbenzoyl, 2,4,6-trimethylbenzoyl, 2,6-dimethyl-4-tert-butylbenzoyl or 3,5-di-tert-butylbenzoyl. Preferred substituents are C₁-C₈alkyl, in particular C₁-C₄alkyl.

C₁-C₁₂Alkyl-substituted benzoyloxy which preferably carries 1 to 3, more preferably 1 or 2, alkyl groups is typically o-, m- or p-methylbenzoyloxy, 2,3-dimethylbenzoyloxy, 2,4-dimethylbenzoyloxy, 2,5-dimethylbenzoyloxy, 2,6-dimethylbenzoyloxy, 3,4-dimethylbenzoyloxy, 3,5-dimethylbenzoyloxy, 2-methyl-6-ethylbenzoyloxy, 4-tert-butylbenzoyloxy, 2-ethylbenzoyloxy, 2,4,6-trimethylbenzoyloxy, 2,6-dimethyl-4-tert-butylbenzoyloxy or 3,5-di-tert-butylbenzoyloxy. Preferred substituents are C₁-C₈alkyl, in particular C₁-C₄alkyl.

Alkyl of up to 25 carbon atoms is a branched or unbranched radical, such as methyl, ethyl, propyl, isopropyl, n-butyl, sec-butyl, isobutyl, tert-butyl, 2-ethylbutyl, n-pentyl, isopentyl, 1-methylpentyl, 1,3-dimethylbutyl, n-hexyl, 1-methylhexyl, n-heptyl, isoheptyl, 1,1,3,3-tetramethylbutyl, 1-methylheptyl, 3-methylheptyl, n-octyl, 2-ethylhexyl, 1,1,3-trimethylhexyl, 1,1,3,3-tetramethylpentyl, nonyl, decyl, undecyl, 1-methylundecyl, dodecyl, 1,1,3,3,5,5-hexamethylhexyl, tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl, octadecyl, eicosyl or docosyl. One of the preferred meanings of R₂ and R₄ is, for example, C₁-C₁₈alkyl. A particularly preferred meaning of R₄ is C₁-C₄alkyl. One of R₂ and R₄ is preferably a branched radical; especially preferred are both R₂ and R₄ branched radicals.

Alkenyl of 3 to 25 carbon atoms is a branched or unbranched radical, such as propenyl, 2-butenyl, 3-butenyl, isobutenyl, n-2,4-pentadienyl, 3-methyl-2-butenyl, n-2-octenyl, n-2-dodecenyl, isododecenyl, oleyl, n-2-octadecenyl or n-4-octadecenyl. Alkenyl of 3 to 18, preferably of 3 to 12, e.g. of 3 to 6, in particular of 3 to 4, carbon atoms is preferred.

Alkenyloxy is oxygen capped alkenyl; preferences are analogous.

Alkynyl of 3 to 25 carbon atoms is a branched or unbranched radical, such as propynyl ($\text{—CH}_2\text{—C}\equiv\text{CH}$), 2-butylnyl, 3-butylnyl, n-2-octynyl, or n-2-dodecynyl. Alkynyl of 3 to 18, preferably of 3 to 12, e.g. of 3 to 6, in particular of 3 to 4 carbon atoms is preferred. Preferences for alkynyloxy (oxygen capped alkynyl) are analogous.

$\text{C}_2\text{—C}_{25}$ Alkyl which is interrupted by oxygen, sulfur or >N—R_{14} is typically

$\text{CH}_3\text{—O—CH}_2\text{—}$, $\text{CH}_3\text{—S—CH}_2\text{—}$, $\text{CH}_3\text{—NH—CH}_2\text{—}$, $\text{CH}_3\text{—N(CH}_3\text{)—CH}_2\text{—}$, $\text{CH}_3\text{—O—CH}_2\text{CH}_2\text{—O—CH}_2\text{—}$, $\text{CH}_3\text{—(O—CH}_2\text{CH}_2\text{—)}_2\text{—O—CH}_2\text{—}$, $\text{CH}_3\text{—(O—CH}_2\text{CH}_2\text{—)}_3\text{—O—CH}_2\text{—}$ or $\text{CH}_3\text{—(O—CH}_2\text{CH}_2\text{—)}_4\text{—O—CH}_2\text{—}$.

$\text{C}_7\text{—C}_9$ Phenylalkyl is typically benzyl, α -methylbenzyl, α,α -dimethylbenzyl or 2-phenylethyl. Benzyl and α,α -dimethylbenzyl are preferred.

$\text{C}_7\text{—C}_9$ Phenylalkyl which is unsubstituted or substituted at the phenyl moiety by 1 to 3 $\text{C}_1\text{—C}_4$ -alkyl is typically benzyl, α -methylbenzyl, α,α -dimethylbenzyl, 2-phenylethyl, 2-methylbenzyl, 3-methylbenzyl, 4-methylbenzyl, 2,4-dimethylbenzyl, 2,6-dimethylbenzyl or 4-tert-butylbenzyl. Benzyl is preferred.

$\text{C}_7\text{—C}_{25}$ Phenylalkyl which is interrupted by oxygen, sulfur or >N—R_{14} and which is unsub-

stituted or substituted at the phenyl moiety by 1 to 3 $\text{C}_1\text{—C}_4$ alkyl is a branched or unbranched radical, such as phenoxymethyl, 2-methylphenoxymethyl, 3-methyl-phenoxymethyl, 4-methylphenoxymethyl, 2,4-dimethylphenoxymethyl, 2,3-dimethylphenoxymethyl, phenylthiomethyl, N-methyl-N-phenyl-methyl, N-ethyl-N-phenylmethyl, 4-tert-butylphenoxymethyl, 4-tert-

butylphenoxyethoxymethyl, 2,4-di-tert-butylphenoxyethyl, 2,4-di-tert-butylphenoxyethoxymethyl, phenoxyethoxyethoxyethoxymethyl, benzyloxymethyl, benzyloxyethoxymethyl, N-benzyl-N-ethylmethyl or N-benzyl-N-isopropylmethyl.

C₇-C₉Phenylalkoxy is typically benzyloxy, α -methylbenzyloxy, α,α -dimethylbenzyloxy or 2-phenylethoxy. Benzyloxy is preferred.

C₁-C₄Alkyl-substituted phenyl which preferably contains 1 to 3, in particular 1 or 2, alkyl groups is typically o-, m- or p-methylphenyl, 2,3-dimethylphenyl, 2,4-dimethylphenyl, 2,5-dimethylphenyl, 2,6-dimethylphenyl, 3,4-dimethylphenyl, 3,5-dimethylphenyl, 2-methyl-6-ethylphenyl, 4-tert-butylphenyl, 2-ethylphenyl or 2,6-diethylphenyl.

C₁-C₄Alkyl-substituted phenoxy which preferably contains 1 to 3, in particular 1 or 2, alkyl groups is typically o-, m- or p-methylphenoxy, 2,3-dimethylphenoxy, 2,4-dimethylphenoxy, 2,5-dimethylphenoxy, 2,6-dimethylphenoxy, 3,4-dimethylphenoxy, 3,5-dimethylphenoxy, 2-methyl-6-ethylphenoxy, 4-tert-butylphenoxy, 2-ethylphenoxy or 2,6-diethylphenoxy.

Unsubstituted or C₁-C₄alkyl-substituted C₅-C₈cycloalkyl is, for example, cyclopentyl, methylcyclopentyl, dimethylcyclopentyl, cyclohexyl, methylcyclohexyl, dimethylcyclohexyl, trimethylcyclohexyl, tert-butylcyclohexyl, cycloheptyl or cyclooctyl. Cyclohexyl and tert-butylcyclohexyl are preferred.

Unsubstituted or C₁-C₄alkyl-substituted C₅-C₈cycloalkoxy is, for example, cyclopentoxy, methylcyclopentoxy, dimethylcyclopentoxy, cyclohexoxy, methylcyclohexoxy, dimethylcyclohexoxy, trimethylcyclohexoxy, tert-butylcyclohexoxy, cycloheptoxy or cyclooctoxy. Cyclohexoxy and tert-butylcyclohexoxy are preferred.

Alkoxy of up to 25 carbon atoms is a branched or unbranched radical, such as methoxy, ethoxy, propoxy, isopropoxy, n-butoxy, isobutoxy, pentoxy, isopentoxy, hexoxy, heptoxy, octoxy, decyloxy, tetradecyloxy, hexadecyloxy or octadecyloxy. Alkoxy of 1 to 12, in particular of 1 to 8, e.g. of 1 to 6, carbon atoms is preferred.

C₂-C₂₅Alkoxy which is interrupted by oxygen, sulfur or >N-R_{14} is typically

CH₃-O-CH₂CH₂O-, CH₃-S-CH₂CH₂O-, CH₃-NH-CH₂CH₂O-, CH₃-N(CH₃)-CH₂CH₂O-,
CH₃-O-CH₂CH₂-O-CH₂CH₂O-, CH₃-(O-CH₂CH₂)₂O-CH₂CH₂O-,
CH₃-(O-CH₂CH₂)₃O-CH₂CH₂O- or CH₃-(O-CH₂CH₂)₄O-CH₂CH₂O-.

Alkylthio of up to 25 carbon atoms is a branched or unbranched radical, such as methylthio, ethylthio, propylthio, isopropylthio, n-butylthio, isobutylthio, pentylthio, isopentylthio, hexylthio, heptylthio, octylthio, decylthio, tetradecylthio, hexadecylthio or octadecylthio. Alkylthio of 1 to 12, in particular of 1 to 8, e.g. of 1 to 6 carbon atoms is preferred.

Alkylamino of up to 4 carbon atoms is a branched or unbranched radical, such as methylamino, ethylamino, propylamino, isopropylamino, n-butylamino, isobutylamino or tert-butylamino.

Di(C₁-C₄alkyl)amino also means that the two radicals are independently of the other branched or unbranched, such as dimethylamino, methylethylamino, diethylamino, methyl-n-propylamino, methylisopropylamino, methyl-n-butylamino, methylisobutylamino, ethylisopropylamino, ethyl-n-butylamino, ethylisobutylamino, ethyl-tert-butylamino, diethylamino, diisopropylamino, isopropyl-n-butylamino, isopropylisobutylamino, di-n-butylamino or di-isobutylamino.

Alkanoylamino of up to 25 carbon atoms is a branched or unbranched radical, such as formylamino, acetylamino, propionylamino, butanoylamino, pentanoylamino, hexanoylamino, heptanoylamino, octanoylamino, nonanoylamino, decanoylamino, undecanoylamino, dodecanoylamino, tridecanoylamino, tetradecanoylamino, pentadecanoylamino, hexadecanoylamino, heptadecanoylamino, octadecanoylamino, eicosanoylamino or docosanoylamino. Alkanoylamino of 2 to 18, in particular of 2 to 12, e.g. of 2 to 6, carbon atoms is preferred.

C₁-C₁₈Alkylene is a branched or unbranched radical, such as methylene, ethylene, propylene, trimethylene, tetramethylene, pentamethylene, hexamethylene, heptamethylene, octamethylene, decamethylene, dodecamethylene or octadecamethylene. C₁-C₁₂Alkylene and, in particular, C₁-C₈alkylene are preferred.

A C₁-C₄Alkyl-substituted C₅-C₁₂cycloalkylene ring which preferably contains 1 to 3, in particular 1 or 2, branched or unbranched alkyl groups is typically cyclopentylene, methylcyclopentylene, dimethylcyclopentylene, cyclohexylene, methylcyclohexylene, dimethylcyclohexylene, trimethylcyclohexylene, tert-butylcyclohexylene, cycloheptylene, cyclooctylene or cyclodecylene. Cyclohexylene and tert-butylcyclohexylene are preferred.

C₂-C₁₈Alkylene which is interrupted by oxygen, sulfur or >N-R_{14} is, for example,

-CH₂-O-CH₂-, -CH₂-S-CH₂-, -CH₂-NH-CH₂-, -CH₂-N(CH₃)-CH₂-, -CH₂-O-CH₂CH₂-O-CH₂-,
-CH₂-(O-CH₂CH₂)₂-O-CH₂-, -CH₂-(O-CH₂CH₂)₃-O-CH₂-, -CH₂-(O-CH₂CH₂)₄-O-CH₂- or
-CH₂CH₂-S-CH₂CH₂-.

C₂-C₁₈Alkenylene is typically vinylene, methylvinylene, octenylethylene or dodecenylethylene. C₂-C₈Alkenylene is preferred.

Alkylidene of 2 to 20 carbon atoms is, for example, ethylidene, propylidene, butylidene, pentylidene, 4-methylpentylidene, heptylidene, nonylidene, tridecylidene, nonadecylidene, 1-methyllethylidene, 1-ethylpropylidene or 1-ethylpentylidene. C₂-C₈Alkylidene is preferred.

Phenylalkylidene of 7 to 20 carbon atoms is typically benzylidene, 2-phenylethylidene or 1-phenyl-2-hexylidene. C₇-C₉Phenylalkylidene is preferred.

C₅-C₈Cycloalkylene is a saturated hydrocarbon group having two free valencies and at least one ring unit and is typically cyclopentylene, cyclohexylene, cycloheptylene or cyclooctylene. Cyclohexylene is preferred.

C₇-C₈Bicycloalkylene is typically bicycloheptylene or bicyclooctylene.

Unsubstituted or C₁-C₄alkyl-substituted phenylene or naphthylene is typically 1,2-, 1,3-, 1,4-phenylene, 1,2-, 1,3-, 1,4-, 1,6-, 1,7-, 2,6- or 2,7-naphthylene. 1,4-Phenylene is preferred.

A C₁-C₄alkyl-substituted C₅-C₈cycloalkylidene ring which preferably contains 1 to 3, in particular 1 or 2, branched or unbranched alkyl groups is typically cyclopentylidene, methylcyclo-

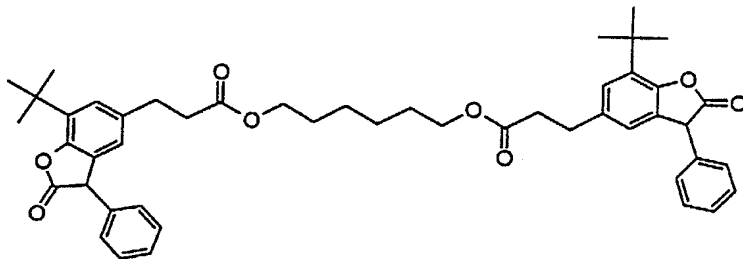
pentylidene, dimethylcyclopentylidene, cyclohexylidene, methylcyclohexylidene, dimethylcyclohexylidene, trimethylcyclohexylidene, tert-butylcyclohexylidene, cycloheptylidene or cyclooctylidene. Cyclohexylidene and tert-butylcyclohexylidene are preferred.

A mono-, di- or tri-valent metal cation is preferably an alkali metal cation, alkaline earth metal cation or aluminium cation, typically Na^+ , K^+ , Mg^{++} , Ca^{++} or Al^{+++} .

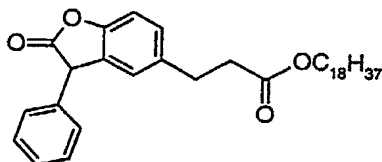
Compounds of the formula V and VI can be obtained in analogy to methods known in the art, e.g. as described in US-5814692 or publications cited therein.

Examples for compounds of the formula V or VI of the invention are:

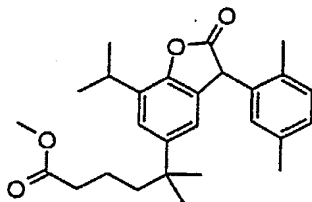
Compound 19:



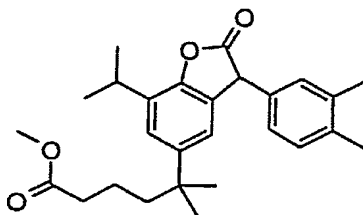
Compound 20:



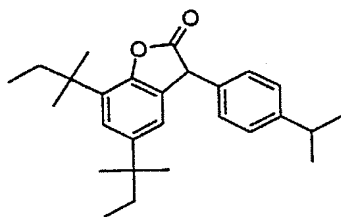
Compound 22:



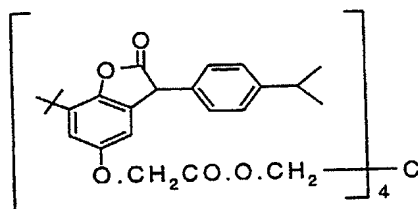
Compound 23^{a)}:



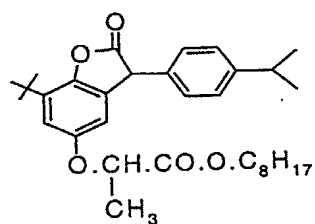
Compound 26^{a)}:



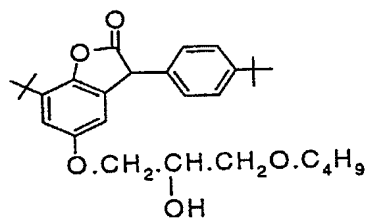
Compound 29:



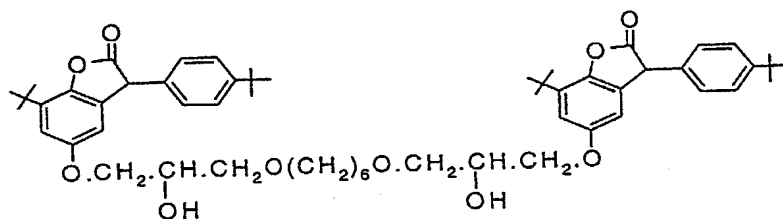
Compound 30:



Compound 31:



Compound 32:



These products may additionally contain minor amounts of other structural isomers in accordance with the substitution at the phenyl ring in 3-position of the benzofuran-2-one.

The synthetic methods used for the preparation of the benzofuran-2-ones shown above are described e.g. in US Patents Nos. 5,607,624 and 5,814,692. Examples for the synthesis of some new compounds among the above are given below from example 8 onwards.

Percentages given in the following examples are by weight if not otherwise indicated. Room temperature denotes a temperature in the range 20-25°C.

Frequent abbreviations used are:

TCP tricesyl phosphate;
RH relative humidity;
m.p. melting point or range;
NMR nuclear magnetic resonance of ^1H .

Synthesis of new compounds

Example 8: 5,7-Di-tert-pentyl-3(4-isopropylphenyl)-3H-benzofuran-2-one (compound No. 26)

- a) 2,6-Di-tert-pentylphenol (161.4 g), glyoxylic acid (122.3 g of the 50% b.w. solution in water) and 1.3 g of p-toluene sulphonic acid are heated in 500 ml of ethylenechloride under nitrogen at reflux temperature in an apparatus designed for the removal of water. After 3.5 hours the reaction mixture is cooled to room temperature, washed 3 times with 25 ml water, dried over magnesium sulphite and evaporated under reduced pressure to give 214.3 g of : 5,7-di-tert-pentyl-3-hydroxy-3H-benzofuran-2-one as an orange coloured oil.
- b) 29.6 g of the product obtained under (a) are heated together with cumane (150 ml) and an acid earth catalyst (Fulcat[®] 22 B, supplied by Laport, GB) under nitrogen to reflux. After 2 hours, the reaction mixture is filtered hot. Evaporation of the filtrate gives 35.1 g of raw product, which is subjected to chromatography on silica gel using hexane/ethyl acetate (4:1) as eluant. 26.7 g of the title product (compound No. 26) are obtained as an orange coloured oil. NMR (CDCl_3) 3-H: 5.29 ppm.

Example 9: Preparation of 7-isopropyl-5-(4-methoxycarbonyl-1,1-dimethylbutyl)-3,4-dimethylphenyl-3H-benzofuran-2-one (compound No. 23)

- a) 5-Methyl-5-(4-hydroxy-3-isopropyl phenyl)-hexanoic acid methyl ester (10.0 g), glyoxylic acid (6.4 g of the 50 % solution in water) and p-toluene sulphonic acid (40 mg) are heated in 40 ml of ethylene chloride under nitrogen at reflux in an apparatus designed for the

removal of water. After 5 hours the reaction mixture is cooled to room temperature, washed two times with 25 ml water, dried over magnesium sulphate and evaporated under reduced pressure to give 13 g of 7-isopropyl-5-(4-methoxycarbonyl-1,1-dimethylbutyl)-3-hydroxy-3H-benzofuran-2-one as a yellow oil.

- b) 13 g of the above product (a), o-xylene (50 ml) are heated together with an acid earth catalyst (see example 8b) under nitrogen at reflux for 2.5 hours. The reaction mixture is filtered hot and the filtrate evaporated to give 16.6 g of a yellow oil. This is chromatographed over silica gel using hexane/ethylacetate 20:5 as eluant. 10.4 g of the mixture of the 2 isomers 7-isopropyl-5-(4-methoxycarbonyl-1,1-dimethylbutyl)-3,4-dimethylphenyl-3H-benzofuran-2-one and 7-isopropyl-5-(4-methoxycarbonyl-1,1-dimethylbutyl)-3-(2,3-dimethylphenyl)-3H-benzofuran-2-one as a slightly brown resin is obtained. NMR (CDCl₃) 3-H: 4.80 ppm.

Example 10: Preparation of 7-Isopropyl-5-(4-methoxycarbonyl-1,1-dimethylbutyl)-3-(2,5-dimethylphenyl)-3H-benzofuran-2-one (compound No. 22)

The product obtained in example 9a (14.35 g), p-xylene (50 ml) and an acid earth catalyst (see example 8b) are treated as described in example 9b to give 9.52 g of the title product (compound No. 22) as a slightly orange resin. NMR (CDCl₃) 3-H: 5.05 ppm.

Example 11: Preparation of compound No. 19

- a) 3-(7-tert.-Butyl-2-oxo-3-phenyl-2,3-dihydro-benzofuran-5-yl)-propionic acid
122.3 g (0.55 mol) 3-(3-tert.-butyl-4-hydroxy-phenyl)-propionic acid (CAS Nr. 107551-67-7) and 92.1 g (0.61 mol) mandelic acid are melted together and then stirred under nitrogen at 200 °C during 4 h. The mixture is then cooled to room temperature, dissolved in toluene and chromatographed on silica gel with dichloromethane-ethyl acetate (3:1) to afford 103 g of the title compound as a pale yellow resin. ¹H-NMR (100 MHz, CDCl₃): 7.4-6.9 m (7 ArH), 4.83 s (1H), 3.00-2.54 m (4H), 1.42 s (t-Bu).
- 23.7 b) 23.7 g (0.07 mol) of the product from example 11a, 4.2 g (0.035 mol) 1,6-hexanediol and 0.3 g p-toluene sulphonic acid are refluxed in 250 ml of xylene under Dean-Stark water separator during 6 h. The mixture is then cooled to room temperature, washed with water, dried with MgSO₄ and evaporated under vacuum. Chromatography of the residue on silica gel with dichloromethane-hexane (19:1) affords the 14.8 g of the compound No. 19 as a pale yellow oil. ¹H-NMR (100 MHz, CDCl₃): 7.4-6.9 m (14 ArH), 4.82 s (2H), 4.08-3.96 m (4H), 2.98-2.51 m (8H), 1.61-1.26 m (4H), 1.42 s (t-Bu).

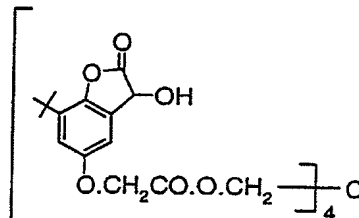
Example 12: Preparation of 7-tert.butyl-5-(2-methoxycarbonylethyl)-3-(2,5-dimethylphenyl)-3H-benzofuran-2-one (compound No. 24)

- a) 3-(4-hydroxy-3-tert.butylphenyl) propionic acid methyl ester (10.0 g), glyoxylic acid (7.4 g of the 50 % solution in water) and p-toluene sulphonic acid (40 mg) are heated in 40 ml ethylene chloride under nitrogen at reflux for 3 hours distilling off all water present and formed during the reaction. The reaction mixture is washed with water, dried over magnesium sulphate and evaporated under reduced pressure to give 13.0 g of 7-tert.butyl-5-(2-methoxycarbonylethyl)-3-hydroxy-3H-benzofuran-2-one.
- b) 13 g of the product from the above example 12a, 50 ml of p-xylene and an acid earth catalyst (see example 8b) are heated under nitrogen at reflux for 2.5 hours. The reaction mixture is filtered hot and the filtrate evaporated under reduced pressure to give 17.0 g of an orange oil. This is purified by column chromatography over 350 g silica gel using hexane/ethylacetate 4:1 as eluant to give the title product, which solidifies after two days. Recrystallization from hexane gives a colourless solid, mp 80°. NMR (CDCl₃) 3-H:4.98 ppm.

Example 13: Preparation of compound No. 29

- a) 2.40 g 2-(3-tert.Butyl-4-hydroxyphenoxy)-acetic acid methyl ester is heated 8hrs. in 100ml toluene at reflux with 0.34g pentaerythritol in the presence of 0.1g p-toluenesulphonic acid. The resulting methanol is distilled off using a Hickmann apparatus. The reaction mixture is cooled to room temperature, washed with water, dried over magnesium sulphate and evaporated under reduced pressure. The residue (2.24g) is treated with glyoxylic acid (1.62g of the 50% solution in water) and p.toluene sulphonic acid (0.1g) and heated in 20ml. ethylene chloride under nitrogen at reflux for 3.5hrs., distilling off all water present and formed during the reaction. The reaction mixture is washed with water, dried over magnesium sulphate and evaporated under reduced

pressure to give 2.80g of compound X of the formula:

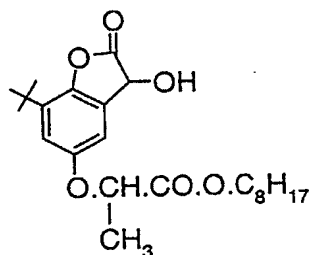


- b) 2.8g Of the above compound X, 25ml.of cymene and an acid earth catalyst (see example 8b) are heated under nitrogen at reflux for 4hrs. The reaction mixture is filtered hot and the filtrate evaporated under reduced pressure to give 3.50g of impure product. This is purified by column chromatography over 160g silica gel using hexane/ ethyl acetate 4:1 as eluant to give purified compound No. 29 as a colourless resin.

Example14: Preparation of compound No. 30

- a) 3.50g 2-(3-tert-Butyl-4-hydroxyphenoxy)-propionic acid octyl ester is heated 3hrs. under nitrogen with glyoxylic acid(1.62g of the 50% solution in water) and p-toluene sulphonic acid (0.1g) in 20ml ethylene chloride at reflux, distilling off the water present and formed during the reaction. The reaction mixture is washed with water , dried over magnesium sulphate and evaporated under reduced pressure to give 4.05g of the below intermediate

XII as a colourless oil:

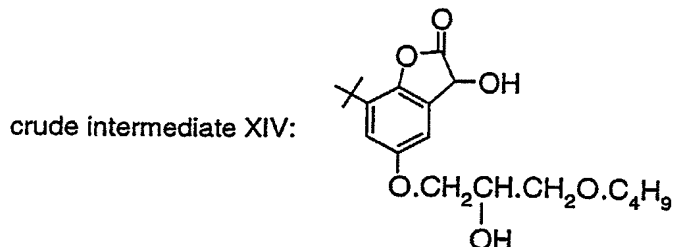


- b) 4.05g of the above intermediate XII, 25ml.cymene and an acid catalyst (see example 8b) are heated under nitrogen at reflux for 3 hrs. The reaction mixture is filtered hot and the filtrate evaporated under reduced pressure to give 4.91g of the title product XIII. This is purified by column chromatography using 150g silica gel and hexane/ethyl acetate 4:1 as eluant to give purified compound No. 30 as a colourless oil.

Example 15: Preparation of compound No. 31

- a) 3.00g 1-Butoxy-2-hydroxy-3-(3-tert.butyl-4-hydroxyphenoxy)-propane is treated with glyoxylic acid (1.62g of a 50% solution in water) and p-toluene sulphonic acid (0.1g) and heated in 20ml ethylene chloride under nitrogen at reflux for 2.5 hrs., distilling off all the water present and formed during the reaction. The reaction mixture is washed with water,

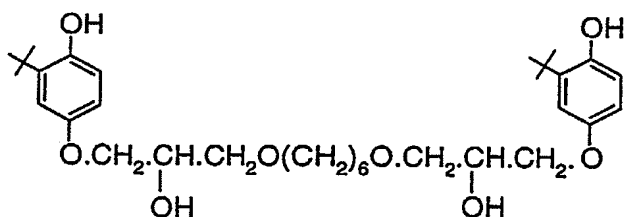
dried over magnesium sulphate and evaporated under reduced pressure to give 3.62 g of



- b) This was heated under nitrogen with an acid catalyst (see example 8b) in 25ml refluxing tert.butylbenzene for 2.5hrs. The reaction mixture is filtered hot and the filtrate evaporated under reduced pressure. The residue is purified by column chromatography over 150g silica gel using hexane/ethylacetate 4:1 as eluant to give compound No. 31 as a colourless oil.

Example 16: Preparation of compound No. 32

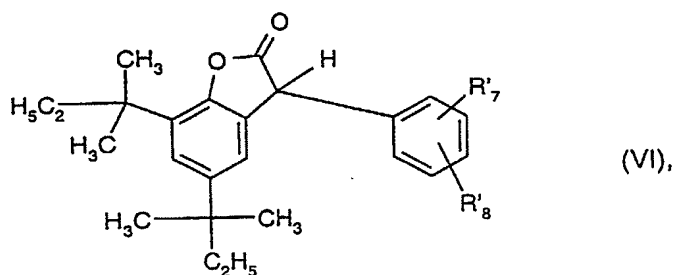
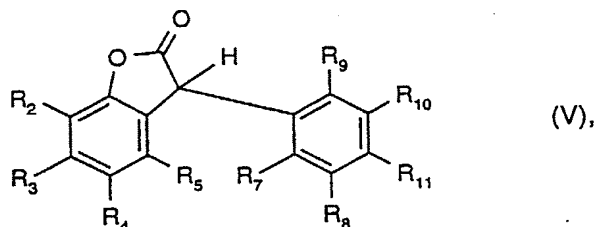
Proceeding as in example 15, but using 2.92g of compound XVI of formula



in step (a) instead of 1-butoxy-2-hydroxy-3-(3-tert.butyl-4-hydroxyphenoxy)-propane one obtains compound No. 32 as a slightly yellow resin.

Claims:

1. Compound of the formula V or VI



wherein

R_4 is $-(CH_2)_5-COR'_{15}$ or $-CH(CH_3)-COR_{15}$ or $-C_{t}H_{2t}-COR_{15}$, wherein C_tH_{2t} is a straight chain or branched alkylene moiety; or R_4 is $-O-(C_vH_{2v})-COR_{15}$; $-O-(CH_2)_q-OR_{32}$; $-OCH_2-CH(OH)-CH_2-R_{15}$; or $-OCH_2-CH(OH)-CH_2-OR_{32}$;

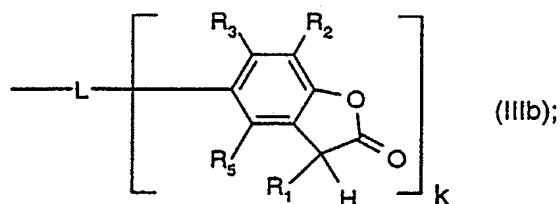
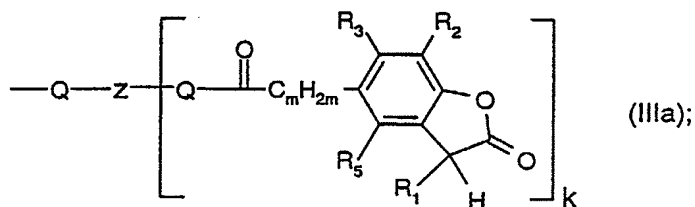
R'_7 is C_1-C_4 alkyl and R'_8 is hydrogen or C_1-C_4 alkyl;

R_{15} is hydroxy, $\left[-O^- \frac{1}{r} M^{r+} \right]$, C_1-C_{20} alkoxy; C_3-C_{20} alkoxy interrupted by O and/or

substituted by a radical selected from OH, phenoxy, C_7-C_{15} alkylphenoxy, C_7-

C_{15} alkoxyphenoxy; or R_{15} is C_5-C_{12} cycloalkoxy; C_7-C_{17} phenylalkoxy; phenoxy; $-N \begin{matrix} R_{24} \\ R_{25} \end{matrix}$;

or a group of formula IIIa or IIIb;



R'₁₅ is C₃-C₂₀alkoxy interrupted by O and/or substituted by a radical selected from OH, phenoxy, C₇-C₁₅alkylphenoxy, C₇-C₁₅alkoxyphenoxy; or R'₁₅ is C₅-C₁₂cycloalkoxy; C₇-C₁₇phenylalkoxy; phenoxy; or a group of formula IIIa or IIIb;

R₃₂ is C₁-C₁₈alkanoyl; C₁-C₈alkanoyl substituted by phenyl or C₇-C₁₅alkylphenyl; C₃-C₁₈alkenoyl; cyclohexylcarbonyl; or naphthylcarbonyl;

L is a linking group of valency (k+1) and is, as a divalent group,

-O-;

Q-C₂-C₁₂alkylene-Q;

-O-CH₂-CH(OH)-CH₂-O-;

-Q-C₂-C₁₂alkylene-Q-CO-C_vH_{2v}-O-;

-O-C₂-C₁₂alkylene-O-CH₂-CH(OH)-CH₂-O-;

Q-interrupted Q-C₄-C₁₂alkylene-Q;

Q-phenylene-Q or

Q-phenylene-D-phenylene-Q with D being C₁-C₄alkylene, O, S, SO or SO₂;

L, as a trivalent group, is Q-capped C₃-C₁₂alkanetriyl, a trivalent residue of a hexose or a hexitol, or a group (-O-CH₂)₃C-CH₂OH; -Q-C_aH_{2a}-N(C_bH_{2b}-Q)-C_cH_{2c}-Q-;

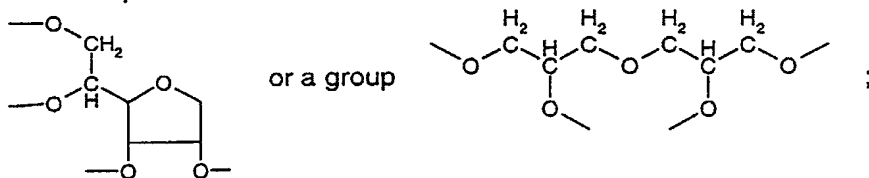
-Q-C₃-C₁₂alkanetriyl(-Q-CO-C_vH_{2v}-O-)₂;

-O-C₃-C₁₂alkanetriyl(-O-CH₂-CH(OH)-CH₂-O-)₂; and

L, as a tetravalent group, is a tetravalent residue of a hexose or a hexitol;

-Q-C₄-C₁₂alkanetetriyl(-Q-CO-C_vH_{2v}-O-)₃;

$-O-C_4-C_{12}\text{alkanetetryl}(-O-CH_2-CH(OH)-CH_2-O-)_3$; Q-capped $C_4-C_{12}\text{alkanetetryl}$; a group

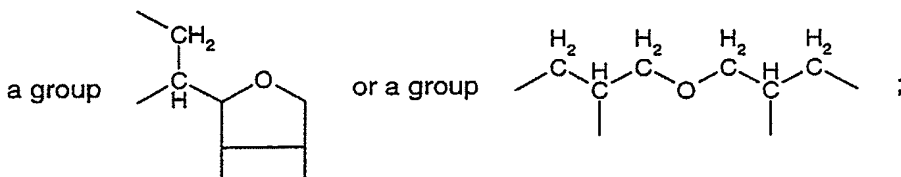


Q is oxygen or $-NH-$,

Z is a linking group of valency $(k+1)$ and is as a divalent group $C_2-C_{12}\text{alkylene}$, Q-interrupted $C_4-C_{12}\text{alkylene}$, phenylene or phenylene-D-phenylene with D being $C_1-C_4\text{alkylene}$, O, S, SO or SO_2 ;

Z, as a trivalent group, is $C_3-C_{12}\text{alkanetriyl}$, a trivalent residue of a hexose or a hexitol, a group $(-CH_2)_3C-CH_2OH$, or a group $-C_aH_{2a}-N(C_bH_{2b})-C_cH_{2c}-$; and

Z, as a tetravalent group, is a tetravalent residue of a hexose or a hexitol, $C_4-C_{12}\text{alkanetetryl}$,



a, b, c and k independently are 1, 2 or 3,

m is 0 or a number from the range 1-12,

s is 1 or 2,

and t is a number from the range 3-12,

v is 1, 2, 3, 4, 5, 6, 7 or 8;

and all other residues are as defined in claim 1 for formula I if n is 1.

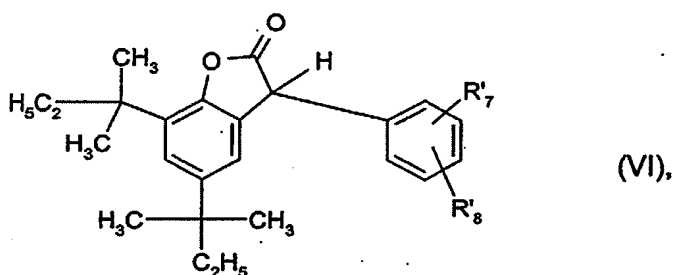
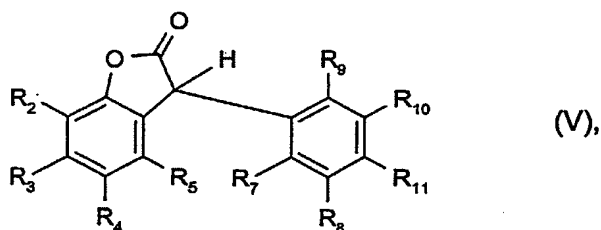
2. Process for stabilizing an organic material against deterioration by light, oxygen and/or heat, which process comprises incorporating a compound of the formula V and/or VI according to claim 1 as stabilizer into said organic material.

3. Use of a compound of the formula V and/or VI according to claim 1 as stabilizer for organic material against deterioration by light, oxygen and/or heat.

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Claims:

1. Compound of the formula V or VI



wherein

R₂ is H or C₁-C₂₀alkyl;

R₃ is H or C₁-C₁₈alkyl;

R₅ is H or C₁-C₁₈alkyl;

R₄ is -(CH₂)_s-COR'₁₅ or -C_tH_{2t}-COR₁₅, wherein C_tH_{2t} is a straight chain or branched alkylene moiety; or

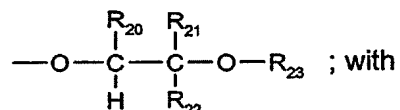
R₄ is -O-(C_vH_{2v})-COR₁₅; -O-(CH₂)_q-OR₃₂;

-OCH₂-CH(OH)-CH₂-R₁₅; or -OCH₂-CH(OH)-CH₂-OR₃₂; or

R₄ is -O-(C_vH_{2v})-CO-C₁-C₂₀alkoxy or -OCH₂-CH(OH)-CH₂-C₁-C₂₀alkoxy;

R₇ and R₉ are each independently of one another hydrogen; halogen; C₁-C₂₅alkyl; C₃-C₂₅-alkenyl; C₃-C₂₅alkynyl; C₇-C₉phenylalkyl; unsubstituted or C₁-C₄alkyl-substituted phenyl; unsubstituted or C₁-C₄alkyl-substituted C₅-C₈cycloalkyl;

R₈, R₁₀ and R₁₁ independently are H, OH, chloro, C₁-C₁₈alkyl, C₁-C₁₈alkoxy, di(C₁-C₄alkyl)amino, C₇-C₉phenylalkyl; unsubstituted or C₁-C₄alkyl-substituted phenyl; unsubstituted or C₁-C₄alkyl-substituted C₅-C₈cycloalkyl; C₂-C₁₈alkanoyloxy, C₃-C₁₈-alkoxycarbonylalkoxy or



R₂₀ is hydrogen or C₁-C₄alkyl;

R₂₁ is hydrogen; unsubstituted or C₁-C₄alkyl-substituted phenyl; C₁-C₂₅alkyl;

C₂-C₂₅alkyl which is interrupted by oxygen, sulphur or >N---R_{14} ;

C₇-C₉phenylalkyl which is unsubstituted or substituted at the phenyl moiety by 1 to 3 C₁-C₄alkyl; C₇-C₂₅phenylalkyl which is interrupted by oxygen, sulphur or

>N---R_{14} and which is unsubstituted or substituted at the phenyl moiety by

1 to 3 C₁-C₄alkyl; or

R₂₀ and R₂₁, together with the linking carbon atoms, form a C₅-C₁₂cycloalkylene ring which is unsubstituted or substituted by 1 to 3 C₁-C₄alkyl;

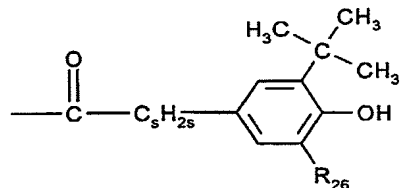
R₁₄ is hydrogen or C₁-C₈alkyl;

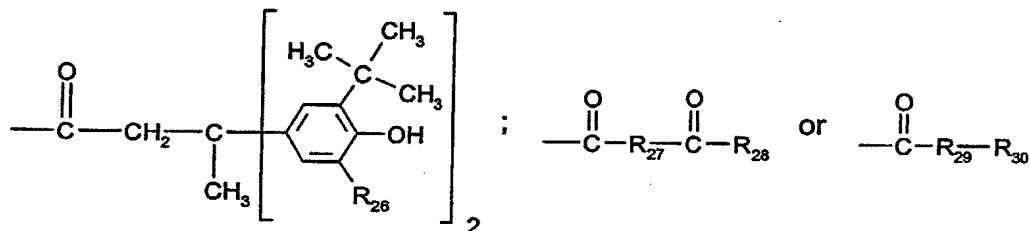
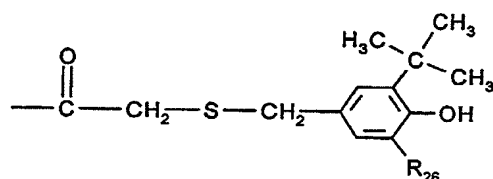
R₂₂ is hydrogen or C₁-C₄alkyl;

R₂₃ is hydrogen; C₁-C₂₅alkanoyl; C₃-C₂₅alkenoyl; C₃-C₂₅alkanoyl which is interrupted by oxygen, sulphur or >N---R_{14} ; C₂-C₂₅alkanoyl which is substituted by a

di(C₁-C₆alkyl)phosphonate group; C₆-C₉cycloalkylcarbonyl; thenoyl; furoyl;

benzoyl or C₁-C₁₂alkyl-substituted benzoyl;





with

R_{26} is hydrogen or $\text{C}_1\text{--C}_4$ alkyl;

R_{27} is a direct bond; $\text{C}_1\text{--C}_{18}$ alkylene; $\text{C}_2\text{--C}_{18}$ alkylene which is interrupted by oxygen,

sulphur or >N--R_{14} ; $\text{C}_2\text{--C}_{18}$ alkenylene; $\text{C}_2\text{--C}_{20}$ alkylidene; $\text{C}_7\text{--C}_{20}$ phenyl-

alkylidene; $\text{C}_5\text{--C}_8$ cycloalkylene; $\text{C}_7\text{--C}_8$ bicycloalkylene; unsubstituted or

$\text{C}_1\text{--C}_4$ alkyl-substituted phenylene;  or  ;

R_{28} is hydroxy, $\left[\text{---O}^- \frac{1}{r} \text{M}^{r+} \right]$, $\text{C}_1\text{--C}_{18}$ alkoxy or $\text{---N} \begin{array}{l} \text{R}_{24} \\ \text{R}_{25} \end{array}$; with R_{24} and R_{25} are

each independently of the other H or $\text{C}_1\text{--C}_{18}$ alkyl,

R_{29} is oxygen or ---NH--- ;

R_{30} is $\text{C}_1\text{--C}_{18}$ alkyl or phenyl;

especially wherein at least 2 of the residues R_7 , R_8 , R_9 , R_{10} , R_{11} are H;

R'_7 is $\text{C}_1\text{--C}_4$ alkyl and

R'_8 is hydrogen or $\text{C}_1\text{--C}_4$ alkyl;

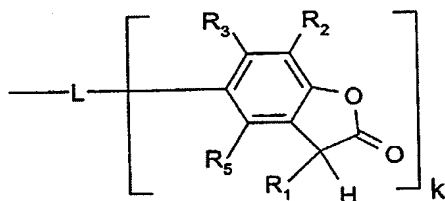
R_{15} is hydroxy, $\left[-O^- \frac{1}{r} M^{r+} \right]$, with M is an r-valent metal cation; r is 1, 2 or 3; and

C_3 - C_{20} alkoxy interrupted by O and/or substituted by a radical selected from OH, phenoxy, C_7 - C_{15} alkylphenoxy, C_7 - C_{15} alkoxyphenoxy; or

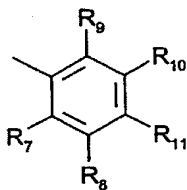
R_{15} is C_5 - C_{12} cycloalkoxy; C_7 - C_{17} phenylalkoxy; phenoxy; $-N \begin{matrix} R_{24} \\ R_{25} \end{matrix}$; with R_{24} and

R_{25} independently are H or C_1 - C_{18} alkyl; or

R_{15} is a group of formula IIIb;



(IIIb); with R_1 is a radical of formula II



(II), wherein R_{7-11} is as defined above,

R'_{15} is C_3 - C_{20} alkoxy interrupted by O and/or substituted by a radical selected from OH, phenoxy, C_7 - C_{15} alkylphenoxy, C_7 - C_{15} alkoxyphenoxy; or

R'_{15} is C_5 - C_{12} cycloalkoxy; C_7 - C_{17} phenylalkoxy; phenoxy; or a group of formula IIIa or IIIb;

R_{32} is C_1 - C_{18} alkanoyl; C_1 - C_8 alkanoyl substituted by phenyl or C_7 - C_{15} alkylphenyl; C_3 - C_{18} alkenoyl; cyclohexylcarbonyl; or naphthylcarbonyl;

L is a linking group of valency (k+1) and is,
as a divalent group,

-O-;

Q- C_2 - C_{12} alkylene-Q;

-O-CH₂-CH(OH)-CH₂-O-;

-Q-C₂-C₁₂alkylene-Q-CO-C_vH_{2v}-O-;

-O-C₂-C₁₂alkylene-O-CH₂-CH(OH)-CH₂-O-;

Q-interrupted Q-C₄-C₁₂alkylene-Q;

Q-phenylene-Q or

Q-phenylene-D-phenylene-Q with D being C₁-C₄alkylene, O, S, SO or SO₂;

- L as a trivalent group, is Q-capped C₃-C₁₂alkanetriyl, a trivalent residue of a hexose or a hexitol, or a group (-O-CH₂)₃C-CH₂OH;

-Q-C_aH_{2a}-N(C_bH_{2b}-Q)-C_cH_{2c}-Q-;

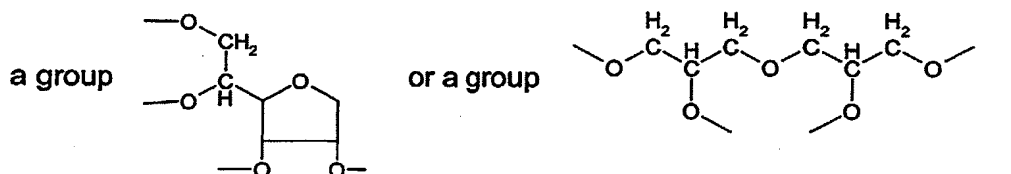
-Q-C₃-C₁₂alkanetriyl(-Q-CO-C_vH_{2v}-O-)₂;

-O-C₃-C₁₂alkanetriyl(-O-CH₂-CH(OH)-CH₂-O-)₂; and

- L as a tetravalent group, is a tetravalent residue of a hexose or a hexitol;

-Q-C₄-C₁₂alkanetetriyl(-Q-CO-C_vH_{2v}-O-)₃;

-O-C₄-C₁₂alkanetetriyl(-O-CH₂-CH(OH)-CH₂-O-)₃; Q-capped C₄-C₁₂alkanetetriyl;

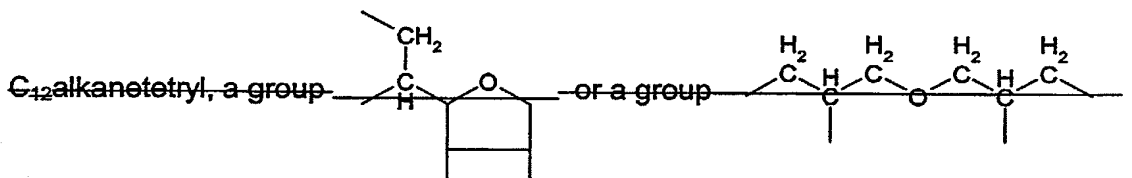


Q is oxygen or -NH-,

~~Z is a linking group of valency (k+1) and is as a divalent group C₂-C₁₂alkylene, Q-interrupted C₄-C₁₂alkylene, phenylene or phenylene-D-phenylene with D being C₄-C₄alkylene, O, S, SO or SO₂;~~

~~Z, as a trivalent group, is C₃-C₁₂alkanetriyl, a trivalent residue of a hexose or a hexitol, a group (-CH₂)₃C-CH₂OH, or a group C_aH_{2a}-N(C_bH_{2b}-)C_cH_{2c};~~ and

~~Z, as a tetravalent group, is a tetravalent residue of a hexose or a hexitol, C₄-~~



a, b, c and k independently are 1, 2 or 3,

~~m is 0 or a number from the range 1-12,~~

q is 1,2,3,4,5 or 6;

s is 1 or 2,

and t is a number from the range 3-12,

v is 1, 2, 3, 4, 5, 6, 7 or 8.

2. Process for stabilizing an organic material against deterioration by light, oxygen and/or heat, which process comprises incorporating a compound of the formula V and/or VI according to claim 1 as stabilizer into said organic material.



INVESTOR IN PEOPLE

Application No: GB 0105372.7
Claims searched: 1-3

Examiner: Stephen Quick
Date of search: 25 July 2001

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.S):

Int Cl (Ed.7):

Other: Online: CAS ONLINE

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	GB 2042562 A (SANDOZ), see especially compounds No 2 & No 10, and examples B & D-G	1-3
X	US 4611016 A (CIBA-GEIGY), see especially table 1 (column 10, compounds 8 & 10); acknowledged in this application	1-3
X	Indian J. Chem., Sect. B, 1980, Vol. 19B(10), pages 891-893, see compounds Vd-f & Vid-f	1

X Document indicating lack of novelty or inventive step
Y Document indicating lack of inventive step if combined with one or more other documents of same category.

& Member of the same patent family

A Document indicating technological background and/or state of the art.
P Document published on or after the declared priority date but before the filing date of this invention.
E Patent document published on or after, but with priority date earlier than, the filing date of this application.